

Claims

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an  
1. A method of planning a device consuming an ephemeral, fungible commodity based upon a knowledge interval collection comprising at least one knowledge interval of said ephemeral, fungible commodity at a time interval  
5 containing a cost, comprising the steps of:

determining said ephemeral, fungible commodity needs over a planning time interval; and

examining said knowledge interval collection based upon said ephemeral, fungible commodity needs over said planning time interval to create a device  
10 operating schedule.

2. A method as in Claim 1, further comprising the step of:  
creating a first knowledge interval of said ephemeral, fungible commodity at a first time interval containing a first cost in said knowledge interval collection.

3. A method as in Claim 2,  
15 wherein the step creating said first knowledge interval is comprised of the steps of:

receiving a knowledge interval creation message to create a received knowledge interval creation message; and

creating said first knowledge interval of said ephemeral, fungible  
20 commodity at said first time interval containing said first cost in said knowledge interval collection based upon said received knowledge interval creation message.

4. A method as in Claim 3,  
25 wherein the step creating said first knowledge interval is comprised of the steps of:

processing said received knowledge interval creation message to create a processed knowledge interval of said ephemeral, fungible commodity at said first time interval containing said first cost; and

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Inserting said processed knowledge interval of said ephemeral, fungible commodity at said first time interval containing said first cost into said knowledge interval collection as said first knowledge interval of said ephemeral, fungible commodity at said first time interval containing said first cost.

5 5. A method as in Claim 3,  
wherein said knowledge interval collection comprises said second knowledge interval of said ephemeral, fungible commodity at said first time interval containing a second cost;

10 wherein the step creating said first knowledge interval is comprised of the step of:

replacing said second knowledge interval with said first knowledge interval in said knowledge interval collection.

15 6. A method as in Claim 3,  
wherein said knowledge interval collection further comprises a first of said knowledge intervals of said ephemeral, fungible commodity at a time interval collection containing at least one time interval and containing a cost.

20 7. A method as in Claim 6,  
wherein said knowledge interval collection further comprises a first of said knowledge intervals of said ephemeral, fungible commodity at a time interval collection further containing at least two time intervals and containing a cost.

8. A method as in Claim 6,  
wherein said knowledge interval collection comprises a second of said knowledge intervals of said ephemeral, fungible commodity at a second of said time intervals containing a second of said costs;

25 wherein said second time interval more than contains said first time interval; and

wherein the step creating said first knowledge interval is comprised of the steps of:

determining a remaining time interval collection of at least one remaining time interval wherein said remaining time intervals collectively exactly contain said second time interval not contained in said first time interval;

replacing said second time interval of said second knowledge interval with  
5 said remaining time interval collection in said knowledge interval collection; and  
inserting said first knowledge interval of said ephemeral, fungible commodity at said first time interval containing said first cost.

9. A method as in Claim 6,

wherein said knowledge interval collection comprises a second of said  
10 knowledge intervals of said ephemeral, fungible commodity at a second of said time intervals containing a second of said costs;

wherein said first time interval more than contains said second time interval;

wherein the step creating said first knowledge interval is further comprised  
15 of the step of:

deleting said second knowledge interval from said first knowledge interval.

10. A method as in Claim 2, further comprising the step of:

removing said first knowledge interval of said ephemeral, fungible commodity at said first time interval containing said first cost from said  
20 knowledge interval collection.

11. A method as in Claim 10,

wherein the step removing said first knowledge interval is comprised of the steps of:

receiving a knowledge interval removal message to create a received  
25 knowledge interval removal message; and

removing said first knowledge interval of said ephemeral, fungible commodity at said first time interval containing said first cost from said

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knowledge interval collection based upon said received knowledge interval removal message.

12. A method as in Claim 10, further comprising the step of:

establishing a real time; and

wherein the step removing said first knowledge interval is comprised of the steps of:

determining whether said first time interval of said first knowledge interval precedes said real time; and

removing said first knowledge interval of said ephemeral, fungible commodity at said first time interval containing said first cost from said knowledge interval collection whenever said first time interval of said first knowledge interval precedes said real time.

13. A method as in Claim 10, further comprising the steps of:

receiving a first knowledge message to create a first received knowledge message;

processing said first received knowledge message comprising:

examining said first received knowledge message to create a message type belonging to a knowledge message type collection comprising create\_knowledge\_interval, remove\_knowledge\_interval;

creating a first knowledge interval of said ephemeral, fungible commodity at a first time interval containing a first cost in said knowledge interval collection based upon said first received knowledge message whenever said message type of said first received knowledge message is create\_knowledge\_interval; and

removing said first knowledge interval of said ephemeral, fungible commodity at said first time interval containing said first cost in said knowledge interval collection based upon said first received knowledge message whenever said message type of said first received knowledge message is remove\_knowledge\_interval.

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14. A method as in Claim 13,  
wherein the step examining said first received knowledge message is  
further comprised of the step of:

examining said first received knowledge message to create a message  
5 type containing at least one member of said knowledge message type collection;  
wherein the step creating a first knowledge interval further comprises the  
step of:

creating a first knowledge interval of said ephemeral, fungible commodity  
at a first time interval containing a first cost in said knowledge interval collection  
10 based upon said first received knowledge message whenever said message type  
of said first received knowledge message contains create\_knowledge\_interval;

wherein the step removing said first knowledge interval is further  
comprised of the step of:

removing said first knowledge interval of said ephemeral, fungible  
15 commodity at said first time interval containing said first cost in said knowledge  
interval collection based upon said first received knowledge message whenever  
said message type of said first received knowledge message contains  
remove\_knowledge\_interval.

15. A method as in Claim 2, further comprising the step of:

20 maintaining a bid interval collection of bid intervals of said ephemeral,  
fungible commodity, each comprised of a bid price, a bid amount; and a bid time  
interval.

16. A method as in Claim 15,

wherein the step maintaining said bid interval collection is comprised of  
25 the steps of:

making a first bid of a first bid amount at a first bid price for a first time  
interval to create a first bid of said bid interval collection comprising said first bid  
amount as said bid amount, said first bid price as said bid price, said first time  
interval as said bid time interval; and

committing of said first bid interval to create a committed first bid interval of said bid interval collection comprising said first bid amount as said bid amount, said first bid price as said bid price, said first time interval as said bid time interval and said committed flag; and

5 wherein each of said knowledge intervals of said knowledge interval collection further contains an amount of said ephemeral, fungible commodity; and

wherein the step creating said first knowledge interval is comprised of the step of:

creating said first knowledge interval of said knowledge interval collection  
10 based upon said first committed bid interval of said bid interval collection.

17. A method as in Claim 16,

wherein the step creating said first knowledge interval is further comprised of the steps of:

15 setting said amount of said first knowledge interval by said first bid amount of said first committed bid interval;

setting said first time interval of said first knowledge interval by said first bid time interval of said first committed bid interval; and

setting said first cost of said first knowledge interval by said first bid price of said first committed bid interval.

20 18. A method as in Claim 16,

wherein the step determining said ephemeral, fungible commodity needs is further comprised of the step of:

examining an equipment usage collection comprised of equipment usage entries each containing a delivery time and a need schedule for said ephemeral,  
25 fungible commodity to create said ephemeral, fungible commodity needs over said planning time interval comprising an amount.

19. A method as in Claim 18,

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wherein the step making said first bid is further comprised of the step of:

20. A method as in Claim 19,

determining an equipment usage plan containing an equipment usage item comprised of an activation time and an action belonging to an action collection comprising start-action, stop-action and throttle-action.

said method of planning said device consuming said ephemeral, fungible commodity as recited in Claim 20 to create said device operating schedule; and the step of:

22. A method as in Claim 21,

25 starting said device based upon said device operating schedule;

23. ~~A method as in Claim 22,~~

wherein the step operating said device comprises the steps of:  
starting said device based upon said device operating schedule;  
stopping said device based upon said device operating schedule; and  
throttling said device based upon said device operating schedule.

5 24. A method as in Claim 23,  
wherein the step starting said device comprises the step of:  
starting said device based upon said at least one of said equipment usage  
item of said equipment usage plan comprising a start-action;  
wherein the step stopping said device comprises the step of:  
10 stopping said device based upon at least one of said equipment usage  
item of said equipment usage plan comprising a stop-action; and  
wherein the step throttling said device comprises the step of:  
throttling said device based upon at least one of said equipment usage  
item of said equipment usage plan comprising a throttle-action.

15 25. A method as in Claim 24,  
wherein said equipment usage item comprised of said throttle-action is  
further comprised of a throttle-setting; and  
wherein the step throttling said device is further comprised of the step of:  
throttling said device based upon at least one of said equipment usage  
20 item of said equipment usage plan comprising said throttle-action and said  
throttle-setting.

26. A method as in Claim 24,  
wherein said equipment usage item comprised of said start-action is  
further comprised of a throttle-setting; and  
25 wherein the step starting said device is further comprised of the step of:  
starting said device based upon at least one of said equipment usage item  
of said equipment usage plan comprising said start-action and said throttle-  
setting.

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27. A method as in Claim 22,  
wherein said device includes a device collection comprised of at least two  
devices consuming said ephemeral, fungible commodity based upon said  
knowledge interval collection comprising at least one of said knowledge interval  
5 of said ephemeral, fungible commodity at said time interval containing said cost;  
and  
further comprising:

said method of planning said device consuming said ephemeral, fungible  
commodity based upon said knowledge interval collection comprising at least  
10 one knowledge interval of said ephemeral, fungible commodity at said time  
interval containing said cost to create said device collection operating schedule;  
and the step of:

operating said device collection based upon said device collection  
operating schedule.

28. A method as in Claim 27,  
wherein the step operating said device collection is further comprised of  
the steps of:

starting at least one of said devices of said device collection based upon  
said device operating schedule;

20 stopping at least one of said devices of said device collection based upon  
said device operating schedule; and

throttling at least one of said devices of said device collection based upon  
said device operating schedule.

29. A method as in Claim 21, further comprising the step of:  
25 metering consumption by said device of said ephemeral, fungible  
commodity.

30. A method as in Claim 29,

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wherein the step metering consumption by said device is further comprised of the steps of:

measuring a consumption rate of said device of said ephemeral, fungible commodity within a metering time interval;

5 determining said cost of said ephemeral, fungible commodity within said metering time interval based upon said knowledge time interval collection to create a metering cost factor of said ephemeral, fungible commodity during said metering time interval; and

10 calculating a consumption cost for said device based upon said consumption rate of said device of said ephemeral, fungible commodity with said metering time interval, and based upon said metering cost factor of said ephemeral, fungible commodity during said metering time interval and based upon said metering time interval to create a consumption cost for said device consuming said ephemeral, fungible commodity over said metering time interval.

15 31. A method as in Claim 30,

wherein the step metering consumption by said device is further comprised of the steps of:

maintaining an accumulated cost for said device of said ephemeral, fungible commodity; and

20 updating said accumulated cost for said device of said ephemeral, fungible commodity based upon said consumption cost for said device consuming said ephemeral, fungible commodity over said metering time interval.

32. A method as in Claim 1,

wherein said device consumes a second ephemeral, fungible commodity;

25 wherein said method of planning said device is further comprised of:

said method of planning said device consuming said ephemeral, fungible commodity and said second ephemeral, fungible commodity based upon said knowledge interval collection comprising at least one knowledge interval of said ephemeral, fungible commodity at a time interval containing a cost and based

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upon a second knowledge interval collection comprising at least one knowledge interval of said second ephemeral, fungible commodity at a time interval containing a cost; and

wherein the step determining said ephemeral, fungible commodity needs is further comprised of the step of:

determining said second ephemeral, fungible commodity needs over said planning time interval; and

wherein the step examining said knowledge interval collection to create said device operating schedule is further comprised of the step of:

examining said knowledge interval collection based upon said ephemeral, fungible commodity needs over said planning time interval and said second ephemeral, fungible commodity needs over said planning time interval to create said device operating schedule.

33. A method as in Claim 1,

wherein said device generating a second ephemeral, fungible commodity; wherein said method of planning said device is further comprised of:

said method of planning said device consuming said ephemeral, fungible commodity and generating said second ephemeral, fungible commodity based upon said knowledge interval collection comprising at least one knowledge interval of said ephemeral, fungible commodity at a time interval containing a cost and based upon a second knowledge interval collection comprising at least one knowledge interval of said second ephemeral, fungible commodity at a time interval containing a price;

wherein the step determining said ephemeral, fungible commodity needs is further comprised of the step of:

determining said second ephemeral, fungible commodity needs over said planning time interval; and

wherein the step examining said knowledge interval collection to create said device operating schedule is further comprised of the step of:

examining said knowledge interval collection based upon said ephemeral, fungible commodity needs and said second ephemeral, fungible commodity needs over said planning time interval to create a device operating schedule.

34. A method as in Claim 1,

wherein said device transports a second ephemeral, fungible commodity;  
wherein said method of planning said device is further comprised of:

said method of planning said device consuming said ephemeral, fungible commodity and generating said second ephemeral, fungible commodity based upon said knowledge interval collection comprising at least one knowledge interval of said ephemeral, fungible commodity at a time interval containing a cost and based upon a second knowledge interval collection comprising at least one knowledge interval of said second ephemeral, fungible commodity at a time interval containing a price;

wherein the step determining said ephemeral, fungible commodity needs is further comprised of the step of:

determining said second ephemeral, fungible commodity needs over said planning time interval; and

wherein the step examining said knowledge interval collection to create said device operating schedule is further comprised of the step of:

examining said knowledge interval collection based upon said ephemeral, fungible commodity needs and said second ephemeral, fungible commodity needs over said planning time interval to create said device operating schedule.

35. A method as in Claim 1,

wherein said ephemeral, fungible commodity is electricity.

36. A method as in Claim 35,

wherein said ephemeral, fungible commodity belongs to the collection comprising DC electricity and AC electricity.

37. A program operating system supporting the method of Claim 1, comprising program steps residing in coupled accessible computer memory coupled to at least one computer of a computing system:

a program step supporting determining said ephemeral, fungible commodity needs over a planning time interval; and

a program step supporting examining said knowledge interval collection based upon said ephemeral, fungible commodity needs over said planning time interval to create a device operating schedule.

38. A computing system supporting the method of Claim 1 comprising:

at least one computer with accessibly coupled computer memory; and

wherein a program operating system containing program steps residing in said accessibly coupled memory of said computer is comprised of the program steps of:

supporting determining said ephemeral, fungible commodity needs over a planning time interval; and

supporting examining said knowledge interval collection based upon said ephemeral, fungible commodity needs over said planning time interval to create a device operating schedule.

39. A control system controlling a device consuming an ephemeral, fungible commodity based upon a knowledge interval collection comprising at least one of said knowledge interval of said ephemeral, fungible commodity at said time interval containing said cost, comprising:

a computing system further comprised of at least one computer with accessibly coupled memory containing program steps of a program operating system;

wherein said program operating system is comprised of the program steps of:

determining said ephemeral, fungible commodity needs over a planning time interval;

examining said knowledge interval collection based upon said ephemeral, fungible commodity needs over said planning time interval to create a device operating schedule; and

operating said device based upon said device operating schedule.

- 5 40. A control system as in Claim 39,  
wherein said program operating system is further comprised of the program step of:

creating a first knowledge interval of said ephemeral, fungible commodity at a first time interval containing a first cost in said knowledge interval collection comprised of the program steps of:

receiving a knowledge interval creation message to create a received knowledge interval creation message containing said ephemeral, fungible commodity at said first cost at said first time interval; and

10 creating said first knowledge interval of said ephemeral, fungible commodity at said first time interval containing said first cost based upon said received knowledge interval creation message.

41. A control system as in Claim 40,  
wherein said program operating system is further comprised of the program step of:

20 maintaining a bid interval collection of bid intervals of said ephemeral, fungible commodity, each comprising a bid price, a bid amount and a bid time interval.

42. A control system as in Claim 41,  
wherein the program step supporting maintaining said bid interval collection is further comprised of the program steps of:

25 making a first bid of a first bid amount at a first bid price for a first time interval to create a first bid of said bid interval collection comprising said first bid

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amount as said bid amount, said first bid price as said bid price, said first time interval as said bid time interval;

committing of said first bid interval to create a committed first bid interval of said bid interval collection comprising said first bid amount as said bid amount, said first bid price as said bid price, said first time interval as said bid time interval and said committed flag;

wherein each of said knowledge intervals of said knowledge interval collection further contains an amount of said ephemeral, fungible commodity; and

wherein the program step creating said first knowledge interval is further comprised of the program step of:

creating said first knowledge interval of said knowledge interval collection based upon said first committed bid interval of said bid interval collection.

43. A control system as in Claim 42,

wherein the program step supporting determining said ephemeral, fungible commodity needs is further comprised of the program step of:

examining an equipment usage collection comprised of equipment usage entries each containing a delivery time and a need schedule for said ephemeral, fungible commodity to create said ephemeral, fungible commodity needs over said time interval comprising an amount.

44. A control system as in Claim 43,

wherein said ephemeral, fungible commodity needs over said time interval is further comprised of a cost limit; and

wherein the program step supporting making said first bid is further comprised of the program step of:

making said first bid of said first bid amount at said first bid price for said first time interval to create said first bid of said bid interval collection comprising said first bid amount as said bid amount, said first bid price as said bid price, said first time interval as said bid time interval based upon said ephemeral, fungible

commodity needs over said time interval comprising said amount and said cost limit.

45. A control system as in Claim 44,  
wherein the program step examining said knowledge interval collection is  
5 further comprised of the program step of:

determining an equipment usage plan containing an equipment usage  
item comprised of an activation time and an action belonging to an action  
collection comprising start-action, stop-action and throttle-action.

46. A control system as in Claim 39,  
10 wherein the program step operating said device comprises at least one of  
the collection comprising the program steps of:

starting said device based upon said device operating schedule;  
stopping said device based upon said device operating schedule; and  
throttling said device based upon said device operating schedule.

15 47. A control system as in Claim 46,  
wherein the program step operating said device is further comprised of the  
program steps of:

starting said device based upon said device operating schedule;  
stopping said device based upon said device operating schedule; and  
20 throttling said device based upon said device operating schedule.

48. A control system as in Claim 46,  
wherein said device includes a device collection comprised of at least two  
devices consuming said ephemeral, fungible commodity based upon said  
knowledge interval collection comprising at least one of said knowledge interval  
25 of said ephemeral, fungible commodity at said time interval containing said cost;  
and

wherein the program step examining said knowledge interval collection is  
further comprised of the program step of:

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wherein said program operating system further comprises the program step of:

49. A control system as in Claim 39,  
wherein said program operating system is further comprised of the  
program step of:

50. A control system as in Claim 49,  
wherein the program step supporting metering consumption is further  
comprised of the program steps of:

determining said cost of said ephemeral, fungible commodity within said metering time interval based upon said knowledge time interval collection to create a metering cost factor of said ephemeral, fungible commodity during said metering time interval; and

~~51. A control system as in Claim 50,~~

wherein the program step supporting metering consumption is further comprised of the program steps of:

maintaining an accumulated cost for said device of said ephemeral, fungible commodity; and

5 updating said accumulated cost for said device of said ephemeral, fungible commodity based upon said consumption cost for said device consuming said ephemeral, fungible commodity over said metering time interval.

52. A control system as in Claim 39,

wherein said device consumes a second ephemeral, fungible commodity;

10 wherein said knowledge interval collection further comprises at least one knowledge interval of said ephemeral, fungible commodity at a time interval containing a cost and at least one knowledge interval of said second ephemeral, fungible commodity at said time interval containing a second cost;

15 wherein the program step determining said ephemeral, fungible commodity needs is further comprised of the program steps of:

determining said ephemeral, fungible commodity needs and said second ephemeral, fungible commodity needs over a planning time interval; and

20 wherein the program step supporting examining said knowledge interval collection based upon said ephemeral, fungible commodity needs over said planning time interval to create a device operating schedule is further comprised of the program step of:

examining said knowledge interval collection based upon said ephemeral, fungible commodity needs and said second ephemeral, fungible commodity needs over said planning time interval to create a device operating schedule.

25 53. A computing system as in Claim 39,

wherein said device generates a second ephemeral, fungible commodity;

wherein said knowledge interval collection is further comprised of a first of said knowledge interval of said ephemeral, fungible commodity at a time interval containing a cost and based upon a second of said knowledge interval of said

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second ephemeral, fungible commodity at an overlapping time interval containing a price;

wherein program operating system of planning said device consuming said ephemeral, fungible commodity based upon said knowledge interval collection further comprises:

said program operating system of planning said device consuming said ephemeral, fungible commodity and generating said second ephemeral, fungible commodity based upon said first knowledge interval and based upon said second knowledge interval;

wherein the program step supporting determining said ephemeral, fungible commodity needs over said planning time interval is further comprised of the program step of:

determining said second ephemeral, fungible commodity needs over said planning time interval; and

wherein the program step supporting examining said knowledge interval collection is further comprised of the program step of:

examining said knowledge interval collection based upon said ephemeral, fungible commodity needs and said second ephemeral, fungible commodity needs over said planning time interval to create said device operating schedule.

54. A computing system as in Claim 39,

wherein said device transports a second ephemeral, fungible commodity;

wherein said knowledge interval collection is further comprised of at least one knowledge interval of said ephemeral, fungible commodity at a first overlapping time interval containing a cost and a second knowledge interval of said second ephemeral, fungible commodity at a second overlapping time interval containing a price;

wherein said first overlapping time interval and said second overlapping time interval overlap said planning time interval;

wherein the program step determining said ephemeral, fungible commodity needs over said planning time interval is further comprised of the program step of:

5 determining said second ephemeral, fungible commodity needs over said planning time interval; and

wherein the program step examining said knowledge interval collection is further comprised of the program step of:

10 examining said knowledge interval collection based upon said ephemeral, fungible commodity needs and said second ephemeral, fungible commodity needs over said planning time interval to create a device operating schedule.

55. A computing system as in Claim 39,  
wherein said ephemeral, fungible commodity is electricity.

56. A computing system as in Claim 55,  
15 wherein said ephemeral, fungible commodity is a member of the collection comprising DC electricity and AC electricity.

57. A method of planning a device generating an ephemeral, fungible commodity based upon a knowledge interval collection comprising at least one knowledge interval of said ephemeral, fungible commodity at a time interval containing a price, comprising:

20 determining said ephemeral, fungible commodity needs over a planning time interval; and

examining said knowledge interval collection based upon said ephemeral, fungible commodity needs over said planning time interval to create a device operating schedule; and

25 wherein said ephemeral, fungible commodity is a member of the collection comprising DC electricity and AC electricity.

58. A computing system supporting planning a device generating an ephemeral, fungible commodity based upon a knowledge interval collection

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containing at least one knowledge interval of said ephemeral, fungible commodity at a time interval containing a price comprises:

at least one computer with coupled accessible computer memory;

wherein a program operating system containing program steps residing in said accessibly coupled computer memory coupled to at least one computer of a computing system, is comprised of the program steps of:

determining said ephemeral, fungible commodity needs over a planning time interval; and

examining said knowledge interval collection based upon said ephemeral, fungible commodity needs over said planning time interval to create a device operating schedule; and

wherein said ephemeral, fungible commodity is a member of the collection comprising DC electricity and AC electricity.

59. A method of planning a device transporting an ephemeral, fungible commodity based upon a knowledge interval collection containing at least one knowledge interval of said ephemeral, fungible commodity at a time interval containing a price, comprising:

determining said ephemeral, fungible commodity needs over a planning time interval; and

examining said knowledge interval collection based upon said ephemeral, fungible commodity needs over said planning time interval to create a device operating schedule; and

wherein said ephemeral, fungible commodity is a member of the collection comprising DC electricity and AC electricity.

60. A computing system supporting planning a device transporting an ephemeral, fungible commodity based upon a knowledge interval collection comprising at least one knowledge interval of said ephemeral, fungible commodity at a time interval containing a price, comprising:

at least one computer with coupled accessible computer memory;

wherein a program operating system containing program steps residing in said accessibly coupled computer memory coupled to at least one computer of a computing system comprised of the program steps of:

determining said ephemeral, fungible commodity needs over a planning  
5 time interval; and

examining said knowledge interval collection based upon said ephemeral, fungible commodity needs over said planning time interval to create a device operating schedule; and

wherein said ephemeral, fungible commodity is a member of the collection  
10 comprising DC electricity and AC electricity.

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